



OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

26 February 2001

MEMORANDUM FOR: SEE DISTRIBUTION

SUBJECT: Call for FY 2001 Common High Performance Computing Software Support Initiative (CHSSI) Project Proposals

The Department of Defense (DoD) High Performance Computing Modernization Program (HPCMP) seeks proposals for new CHSSI projects in FY 2001 to develop scalable high-performance software for DoD applications in four areas: System-of-Systems Simulations, Sensor/Scene Processing and Generation, Materials by Design, and Acoustics. Representatives from the DoD Services and Agencies provided thirty-eight proposed CHSSI topic areas with associated points of contact. These input were used to synthesize the above list. Portfolios of multi-disciplinary projects will be built around these four themes.

The leaders of the four portfolios were selected from the technical points of contact named in the submissions from the Services and Agencies. The leaders for these four portfolios will be responsible for creating the structure of the portfolio, for evaluating the proposals submitted for the portfolio, for presenting the portfolio to the Director, HPCMP for approval, and for subsequent leadership and management of the portfolio.

Proposals should address the following four topic areas:

1. System-of-Systems Simulation (S3)

Portfolio Leader: Mr. Rick Cozby, Army

(e-mail: cozbyr@dtc.army.mil, Voice: 410-278-1474)

This portfolio calls for the development of scalable software that emphasizes the integration of autonomously operating weapons systems into a dynamically controlled information network or System-of-Systems (SOS). In recent years, the Department of Defense (DoD) has recognized that weapons systems operating autonomously provide a less than optimal solution to our national security problems. Information processing nodes in the network will fuse information from other nodes to provide a relevant battlespace view to friendly participants. Due to its complexity, development and implementation of this capability will rival any other difficult development performed by DoD. Testing of SOS will require simulations more complex than any developed to date. The tracking of interaction between hundreds of thousands of players, complex weapons systems, and environmental models while merging physics with information theory can only be achieved through the aggressive application of high performance computing and networking technologies. Application areas in this portfolio include: (1) missile fly-out modeling, (2) virtual prototyping, (3) Hardware/Man-in-the-Loop simulations, and (4) forces modeling.

2. Sensor/Scene Processing and Generation (SPG)

Portfolio Leader: Mr. Jere Matty, Air Force

(e-mail: jere.matty@arnold.af.mil; Voice: 931-454-6615)

This portfolio calls for the development of scalable software that will exploit HPC resources to advance Sensor/Scene Processing and Generation (SPG) technology area to support the scientific research, development, and testing of DoD systems, weapons, tactics, and information technologies under battlefield environment conditions. It is expected that scalable (real-time/non-real-time) software will assist the research and development as well as the application of technology to the virtual testing of sensors including multi-function sensors, algorithms, and techniques in weapon models, hardware-in-the-loop, installed systems, and concept systems. Application areas and computational techniques include (1) single or multi-spectral target and background signature modeling and scene generation, (2) scene generation VV&A software tools, (3) signal and image processing, (4) image cueing and automatic target recognition, (5) low-observables/counter low-observables, and (6) unified problem solving environment for SPG.

3. Materials by Design

Portfolio Leader: Dr. Dimitris Papaconstantopoulos, Navy

(e-mail: papacon@dave.nrl.navy.mil, Voice: 202-767-6880)

This portfolio calls for the development of reliable software that can exploit DoD HPC infrastructure to advance “Materials by Design” efforts. It is expected that the codes will be capable of addressing the design of a wide-range of materials, including metals, molecular and nanoscale materials, high energy density materials, optical materials, nanowire materials for spin quantum computing devices, polymer nanocomposites, and functional surfaces. Codes developed will couple with structural mechanics approaches to achieve a microscopic-to-macroscopic algorithmic parallelization link. Methodologies for these codes include: (1) density functional methods that can couple with molecular dynamics and many-body methods, (2) structural mechanics approaches as they may be used in a multi-disciplinary computational environment to link with electronic structure, molecular dynamics and Monte Carlo codes, (3) diffusion equation methodology, (4) fast multipole algorithms for *ab initio* methods, and (5) weak convergence methods that link continuum level equations with atomic level phenomena.

4. Acoustics

Portfolio Leader: Mr. Stephen Schreppler, Navy

(e-mail: schreps@onr.navy.mil, Voice: 703-696-4716)

This portfolio emphasizes the need for scalable structural acoustic prediction capabilities. Current ability to model the acoustic response of complex structures is inadequate to meet the needs of a wide range of design and S&T communities. Improved capabilities are required for such diverse applications as ships and submarines, air and space vehicles, weapons systems, and land transportation. Recent algorithmic advances have created new opportunities for greatly improving the accuracy and efficiency of structural acoustic prediction. Proposals are sought to incorporate the new state-of-the-art methodologies into an efficient modeling software suite. Areas to be addressed include adaptive analysis for structural acoustics, mesh generation for high order elements, and efficient treatment of the infinite fluid domain. The goal of the project is the incorporation of these techniques into a software suite amenable to large design analyses.

All computational scientists and engineers in DoD S&T and T&E laboratories, centers, facilities, and agencies may submit DoD CHSSI project proposals. The proposal's project leader must be a government DoD employee. Parts of the proposed project can be contracted to industry, academia, or other government laboratories as appropriate. Funding for CHSSI projects ranges from \$250,000 to \$500,000. Proposal project leader should contact the appropriate portfolio leader prior to submission of the proposal for additional technical and funding information.

The attached package details the submission, evaluation and selection processes, as well as proposal instructions. Please note that the due date for proposals to the CHSSI Project Manager is **1400 EST 28 March 2001**.

My point of contact for this process is Dr. Leslie Perkins, CHSSI Project Manager. She may be reached at 703-812-8205 or by e-mail at lperkins@hpcmo.hpc.mil.

Cray J. Henry
Director
High Performance Computing
Modernization Program

Attachment:
FY 2001 CHSSI Project Selection Plan

cc:
HPC Advisory Panel
CTA Leaders

DISTRIBUTION:

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Director, Air Force Research Laboratory/Propulsion Directorate
Director, Air Force Research Laboratory/Sensors Directorate
Director, Air Force Research Laboratory/Air Vehicles Directorate
Director, Air Force Research Laboratory/Space Vehicles Directorate
Director, Air Force Research Laboratory/ (SAF/AQR)
Director, Defense Advanced Research Projects Agency
Director, Defense Threat Reduction Agency
Director, Joint Interoperability Test Command

FY2001 CHSSI Project Selection Plan

Submission: Proposal submissions must be mailed electronically to Dr. Leslie Perkins at lperkins@hpcmo.hpc.mil no later than 1400 EST 28 Mar 2001. The electronic document must be either a MS Word 97 format file or an Adobe Acrobat (*.pdf) format file. Proposal text is limited to 10 pages (single-spaced, 12-point Times New Roman font) and must adhere to the proposal format attached below. A title page for the proposal is also required and is not included in the 10-page limit.

Evaluation: Proposals will be collected and catalogued at the HPCMO and sent to each portfolio leader. The portfolio leader will assemble and chair a panel to evaluate the proposals according to the following criteria:

1. Fit of the Proposed Project within the Portfolio Topic
Does the project fit the structure of the portfolio?
2. Scientific/Technical Merit of the Proposed Project
Value of the software proposal to the portfolio topic to which the project applies, soundness of the technical approach, and level of innovation.
3. Qualifications of the Proposers (and their previous accomplishments).
4. Financial Planning, Resourcing, and Project Management
This criterion includes such factors as appropriateness of the requested funding level, identification of outside sources of funding, description of how the project leverages ongoing activities, and the level of service or multi-service commitment to support completed projects.

Selection: The portfolio leader will present the evaluation team's recommendations to the CHSSI Project Manager and the HPCMP Director for approval. After approval by the HPCMP Director, an announcement of FY 2001 CHSSI project awards will be made to the DoD user community and Service/Agency executives.

Proposal Format: Proposals will be structured such that they contain the following sections in the order listed below.

Title Page: The title page must include:

Project Title (Short descriptive title; 2 lines maximum)

Project Leader: (Name, organization, position, mailing address, voice phone number, fax number, E-mail address)

Portfolio: List the portfolio for which the proposal is submitted.

Funding: List the total requested funding per year.

Executive Summary (1 page maximum): Provide an executive summary of the proposal.

Goals and Objectives: Describe concisely the goals and objectives of the proposed project.

Technical Approach: Proposed projects must focus on developing scalable portable versions of existing critical DoD application software or relevant infrastructure software. Discuss the approach and method(s) to be used for the proposed software project and the scalable capability to be developed. Explain why scalable versions of this capability are needed/valuable to critical DoD problems and relate the proposed project to the portfolio topic. Describe the history of the algorithms to be used and briefly describe the verification and calibration that the application software has undergone. In addition, discuss any links to, leveraging of, or collaboration with other scalable software projects under the aegis of other DoD or government agencies, industry, or academic institutions.

Describe the proposed approach to achieving software scalability, portability, and reusability for DoD scalable high performance computing platforms. Other topics to be addressed in this section include: (1) description of benchmarks and known numerical and/or experimental data for validating and evaluating the proposed scalable application software, (2) discussion of plans to ensure compatible performance with existing and planned scalable application software, (3) description of the risks associated with the proposed approach as well as steps to mitigate them, and (4) description of how the proposed project enhances the DoD capability to model/analyze critical defense problems.

Scalable Software Products & Other Deliverables: List the specific software products. Describe briefly the commitment of the project participants to maintain the software beyond the duration of this project. For each software deliverable discuss how it benefits the DoD community.

Target Computer Systems and Required Computing Resources: Identify two or more DoD HPC systems that will be used to develop scalable implementations of the proposed software. In addition, identify the DoD scalable high performance computing platforms to be used for demonstration and production computations of critical DoD problems.

Project Team: Describe the makeup of the integrated project team and identify contributions of each project participant. Specify each participant's fraction of effort associated with this proposed project. Provide one-page resumes of the key participants that include brief descriptions of qualifications (highlighting experience in high performance computing and/or computational science), full name, organization, position, telephone number, and e-mail address. Please note that inter-service teaming is highly encouraged.

Funding Requirements (by year): The financial resources to execute the proposed project should be presented in this section. The planned distribution of funds between project participants should be documented in this section also. Identify any "matching" funding from other government agencies, academia, or industry that will be leveraged. Proposers should note that there are considerable software testing, documentation writing, and status reporting requirements imposed on CHSSI. Proposals should budget for these requirements. CHSSI policies include revision control, alpha- and beta-testing, monthly financial reporting, quarterly progress reporting, and annual reviews.

References: List any applicable publications relevant to the proposed project.

Export Control and Intellectual Property Rights: In this section discuss the intellectual property rights and security classification/export control issues associated with the development of the proposed software. Typically, CHSSI software binary and source code is widely disseminated in the DoD. If this is not true for this project, please explain.

Post-Selection Requirements: Upon selection of a project, the project leader must provide a letter of endorsement from their laboratory or test center director.